2.11.2 Project: Performance Task: The Parallax Problem Project
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ALS Geometry *Points Possible:* 120

The Scenario: You're looking for a sponsor to pay for you to participate in a sailboat race. Now that you've solved the parallax problem, use the same skills you used there to write a proposal that shows that you can win the race.

The Project: Use the information provided in the performance task to estimate your travel costs and to calculate your average speed and the speed of last year's winner. Use the questions below to help you gather information to write your proposal.

Part I: Which race? Choose a city (8 points)

When you write your proposal, you'll need to tell your sponsor about the costs and risks involved in the race you've chosen. You'll investigate these in Part I.

1. Which city did you pick and why? (**2 points**)
Answer: Sidney because I'd like to go there.

2. What is one common boating hazard in this city? (**2 points**)

Answer: It is shallow, but busy. The hazards include rocks stingrays and sharks.

3. What are your total travel expenses? (**4 points**: 2 points for airfare/hotel. 1 point for total)

Answer: My round trip air fare is $2000. My hotel is $250/night for 10 nights or 2500. My total travel expense is $4500

Part II: Which category? Choose your boat (10 points)

Your proposal will also discuss how likely it is that you'll win the race. In Part II, you'll calculate your average race speed for the type of boat you've chosen.

1. Which boat did you choose and why? (**2 points**)

Answer: Catamarran since it is less likely to turn over.

2. What is one advantage of your boat? (**2 points**)

Answer: it is faster

3. What is one disadvantage of your boat? (**2 points**)

Answer: harder to turn back over if it capsizes

4. For the city and boat you picked above, what were the speeds of your last three races (in knots)? (**2 points**)

Answer: 6.09 9.90 9.90

5. What is your average race speed? (**2 points**)

Answer: 8.61

 Part III: The Olympic triangle (22 points)

1.Draw a sketch of the short course triangle below, labeling the points *A*, *B*, and *C*. Don't draw it on your master map yet! (**3 points**)

2. Draw the arrows to represent your path along the course. (**3 points**)

3. Where do you start? (**3 points**)

Answer: point a

4. What are the measures for angles *B* and *C*? (**3 points**)

Answer: 60 degrees

5. What is the measure for angle *A*? (**3 points**)

Answer: 60 degrees

6. What do you know about the distance between each buoy? (**3 points**)

Answer: They are equal

7. The wind is blowing opposite to leg *AB*. Given the fact that you're traveling in a wind-powered boat, which leg of the course will take you the longest? Why? (**4 points**)

Part IV: Last year's winner (9 points)

Your sponsor will need to know how your average speeds compare to the speeds of past winners. In Part IV, you'll find out how to calculate boat speeds in *knots* (nautical miles per hour).

1. What was the winning time of last year's race for your city and boat? (**2 points**, one for each leg)

Answer: 16.5 Minutes

2. Do you know how fast last year's winner was traveling? (**2 points**)

Answer: No

3. What information do you need to know to calculate last year's winning speed? Remember, the distance traveled (length of the course) is equal to the rate (boat's speed) times the time. (**2 points**)

Answer: Distance traveled

A nautical mile is 6076 feet. A speed of one nautical mile per hour is a *knot*. In the next two questions, you will convert a speed in feet per minute to knots.

4. If you travel 1000 feet in 5 minutes, what is your speed in feet per minute? (**1 point**)

Answer: 200 feet per minute

5. What is your speed in knots? Hint: Use the number of minutes in an hour to convert the speed to feet per hour. Then use the number of feet in a nautical mile to convert feet per hour to knots. (**2 points**: 1 point for finding the speed in feet/hr, 1 point for converting to knots)

Answer: 1.974946 kt

 Part V: The map (20 points)

In Part V, you're going to use your knowledge of parallax to find the distance of the race course. Below is a grid to draw your Master map on. Use this to draw your parallax triangles and distances. Don't worry about drawing your map to scale. The grid is there to help you draw straighter lines.

1. What are the two landmarks from your city that you'll use for parallax? (**2 points**)
Answer: Hazard Buoy and north tower

2. What is the distance between your two landmarks? (**2 points**)

Answer: 1700 Feet

3. Call the North Landmark *L1* and the South Landmark *L2*. Sketch the points *L*1 and *L*2 on your map. (**2 points**)

4. What is the fixed point in the water that you will use for parallax? (**2 points**)

Answer: **Hazard buoy**

5. Call your fixed point *P*. Sketch the point *P* onto the map. (**2 points**)

6. What is the distance from your fixed point *P* to the line between *L*1 and *L*2 (called *L*1*L*2)? (**2 points**)

7. Draw the line from your fixed point P to the line *L*1*L*2 and add to the length of this line. (**2 points**)

8. Label the point of intersection between line *L*1*L*2 and the new line as point *D*. (**2 points**)

9. What is the distance from *L*1 to *D*? That is, what is the measure of the line segment *L*1*D*? Hint: review the diagram in "The Race Course" section of the Performance Task. (**2 points**)

10. What is the distance from *L*2 to *D*? That is, what is the measure of the line segment *L2D?* (**2 points**)

Part VI: Solving the problem. (10 points)

In Parts VI, VII, and VIII, you'll use your map to find the length of the race course. Knowing the distance will allow you to find the average speed of last year's winner.

Draw the Olympic triangle on your map.
1. Buoy marker *A* was set so that it's in a perfect line of sight with the hazard buoy and the landmark *L2*. Draw buoy *A* so that it's in the proper line. You can choose the position of buoy *A*. (**2 points**)

2. The first leg of the racing triangle *AB* runs parallel to the bridge. Draw this line. (**2 points**)

3. Buoy marker *B* was set so that it's in a perfect line of sight with the hazard buoy and the landmark *L1*. Draw buoy *B* so that it's on the parallax line. (**2 points**)

4. Sketch buoy marker *C*, remembering what you know about the Olympic triangle. Don't worry if your drawing is not to scale. (**2 points**)

5. What is the distance from the hazard buoy to racing buoy *A*? Hint: review the diagram in "The Race Course" section of the Performance Task. Write this distance on your map. (**2 points**)

Part VII: Calculate the distances. (23 points)
1. What is the distance from the hazard buoy *P* to the southern landmark *L2*? Use this formula: $d^2 = (DL2)^2 + (PD)^2$, where *d* is the distance from *P* to *L2*, *DL2* is the distance from *D* to *L2*, and *PD* is the distance from *P* to *D*. Round to the nearest foot. (**5 points**)

2. What triangles are similar? How do you know? (**5 points**)

3. What is the distance between buoy *A* and *B*? (**5 points**)

4. What are the lengths of the other two triangle legs? (**4 points**: 2 points each)
Remember what you know about the shape of the Race Course.

5. What is the total length of the race course? (**4 points**: 3 for calculation, 1 for answer)

Part VIII: Calculate the winner's speed. (10 points)
1. What was the winner's speed during last year's race? (**5 points**: 3 points for speed. 2 points for conversion to knots).
Answer: Speed is 50

2. How does the winner's speed compare with your average speed? How much faster or slower are you? (5 points)
Answer: The winner's speed is 30 mph faster than me.

Part IX: Write your proposal. (8 points)

Now it's time to make your proposal to the sponsor. Your sponsor will have their logo on your boat, so they want to be sure it's likely to do well. The sponsor also needs to know what the expenses and risks are, so they know how much their investment in you will cost.

1. Complete the table to summarize the results of your study. (**4 points**)

Category:		**Race:**
Risk Analysis:	Itemized Travel Cost	**It is shallow, but busy. The hazards include rocks stingrays and sharks.**
	Safety hazards	
Competitive Analysis:	My time and speed	**50 mph**
	Last year's winning time and speed	
Reward Analysis:	My chances of winning	**My chances of winning are very high**

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2. Write a summary paragraph explaining why the sponsor should accept your proposal. (**4 points**)

Answer: The sponsor should accept my proposal because I will produce the most legendary race that will ever be sponsored. This race would be like Fast and Furious but with boats. The hazards will bring the excitement and depth to the race. The risk combined with the competitiveness will ultimately increase the return on investment for the sponsor.